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PROPOSED SOVIET CLASSIFICATION AND
NOMENCLATURE FOR VARNISHES AND ENAMEL PAINTS

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At present there is in the USSR and abroad no acknowledged, scientifically based classification of varnish and paint products. Nor is there a uniform nomenclature or system for designating manufactured varnishes and paints.

The creation of a classification system for paint and varnish production is a difficult task and requires the consideration and systematizing of a wide assortment of materials, differing widely in composition, properties, uses, methods of application, and drying conditions. Furthermore, it is necessary to study the prospective development of the varnish and paint industry in order that the classification worked out will be sufficiently permanent. No less difficult is the creation of a uniform nomenclature and designation system for varnish and paint products even with the classification system now available.

The existing classification of oil-resin varnishes (GOST 5470-50) is based exclusively on consumer names and embraces only a small group of manufactured products. The attempt to classify varnish and paint materials only from the consumer point of view leads to an unsystematic arrangement, repetition, and an artificial organization of their uses.

The classification of A. Ya. Drinberg is based upon the systematizing of film-forming materials according to their composition. A further subdivision is carried out according to various indicators: for varnishes based on rosin, copals, and alkyderesins, according to the content of oil, and for varnishes based on cellulose esters, according to the consumer names (varnishes used for metal, wood, leather, etc.). Based on a sound principle for dividing varnishes according to the basic film-forming material, it has not been developed into a sufficiently clear system and does not result in the required differentiation, since it combines into one group varnishes based on silico-organic, aniline-formaldehyde, polyurethane, and cyclohexane resins, possessing various properties.

The classification proposed by V. S. Kiselev and a group of workers at NIILK (Scientific Research Institute for Paints and Varnishes) in 1939, should also be considered. These classifications, set up mainly for oil varnishes, are based on the proper premises, but they have not been completely finished and have not been generally accepted in industry.

The lack of a uniform standard classification for varnishes and enamel paints has prevented the creation of a rational nomenclature and designation system, resulting in unsystematic, chaotic, and haphazard selection of designations for varnish and paint products.

Classification and Nomenclature of Varnishes

On the basis of the classification of varnishes proposed by the authors, their composition is established, in large part characterizing the properties of the coating. The basic film-forming materials used as protective coatings are vegetable oils, natural resins, cellulose esters, and synthetic resins obtained by a polycondensation or polymerization reaction.

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The good protective properties of paint and varnish coatings are achieved by the use of various synthetic resins which already are high-molecular compounds or are converted into such compounds in the process of development of the film. These include the widely known polyester resins, modified oils (glytals, pentaphthals, etc.) the development of which is continuing.

The rapid development of the synthesis of resins, possessing good protective properties, has established a leading role for them in the formulas of varnishes. In recent years, the various high-molecular resins, in which mechanical strength is combined with good protective qualities, have begun to achieve still greater significance (polychlorvinyl, polyethylene, polyvinylacetate, etc.).

In the proposed classification, along with the resins already used in the production of varnishes and enamel paints have been included those which may be used in the future. Thus, in the classification of varnishes they have been divided according to the basic film-forming material -- resin.

All varnishes have been divided into four basic varieties:

- I - varnishes based on natural resins and their compounds
- II - varnishes based on synthetic condensation resins
- III - varnishes based on polymerized resins
- IV - varnishes based on cellulose esters

Still another classification (V) has been provided for, which includes the so-called "mixed" varnishes, that is, those in which two or more resins are included, in the composition of the film-forming material, no single one of which is, however, considered to impart a basic determining property to the varnish.

Each variety is subdivided into classes which provide for the division of the varnishes according to the basic resin determining their property. The class is designated by a letter system which makes it easy to identify them (Kf - rosin [kanifol'], Bt - bitumen [bitum], Gf - glyptal [gliftal'], Fl - phenol resin [fenol'naya smola], Mch - urea resin [mocheviannaya smola], etc.)

A further division (establishment of types) for varnishes I and II (for natural and condensation resins) is set up according to the quantity of oil contained in the base (resin oil) of the varnish. Each class is divided into ten types, in which the content (quantity) of oil in the base is arranged in descending order - from 90 percent to complete absence (oil-free, pure resin varnish).

It is known that varnishes produced from resins combining varieties III and IV in the majority of cases contain other resins (natural, condensation, polymerized, or cellulose esters) as admixtures, which lend the required elasticity to the varnish, improve its adhesion to surfaces, or give it other properties required of the varnish, depending upon how it is used. Therefore, varnishes of varieties III and IV are subdivided into types according to indications of content of other resins added to the basic resin in order to give the varnish certain properties.

Thus, the proposed classification is sufficiently simple and systematically arranges all varnishes according to their composition, which predetermines their operational properties.

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Classifications of Varnishes					
Variety		Class		Type	
Variety	Designation	Symbols for Classes	Characteristics	Type No	Oil-Content (%), not less than
I	Natural resins and their compounds	Kf	Rosins, their salts and compounds	9	90
				8	80
				7	70
				6	60
				5	50
				4	40
				3	30
				2	20
				1	Less than 20
				0	Oil-free
II	Synthetic Condensation resins	Nt	Natural resins (amber, shellac, dammar, mastic, copal, etc.)		
		Bt	Asphalts, asphaltites, bitumens, and pitches		
		Sn	Mixtures of natural resins		
		Gf	Polyester glycerin resins (glyptal, etc.)		
		Pf	Polyester pentaerythrite resins (penta-phthalic, etc.)		
		Pe	Other polyester resins		
		Fl	Phenol resins		
		Mch	Urea resins		
		Ml	Melamine resins		
		Kn	Carbonyl resins (cyclohexane)		
		Ad	Polyamide resins		
		Ko	Silico-organic resins		

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Variety		Class		Type	
<u>Variety</u>	<u>Designation</u>	<u>Symbols for Classes</u>	<u>Characteristics</u>	<u>Type No</u>	<u>Oil-Content (%), not less than</u>
III	Synthetic polymerized resins	Sk	Mixtures of condensation resins		
		Et	Polyethylene and polyisobutylene resins		Containing admixtures of natural condensation, polymerized resins, and cellulose esters
		Nf	Petroleum polymerized resins		
		Kch	Rubbers		
		Nhk	Chlorinated rubbers		
		Vn	Vinylacetylene and divinylacetylene resins		
		Ki	Coumarone-indene resins		
		Khv	Polychlorvinyl and perchlorvinyl resins		
		Ur	Polyurethane resins		
		Khs	Copolymers of chlorvinyl		
		Ak	Acryl and metacryl resins		
		As	Acryl copolymers		
		Va	Polyvinylacetate resins		
		Vl	Polyvinylacetal resins		
		Ps	Polystyrene resins		
		Es	Polyester-styrene resins		

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Variety		Class		Type	
<u>Variety</u>	<u>Designation</u>	<u>Symbols for Classes</u>	<u>Characteristics</u>	<u>Type No</u>	<u>Oil-Content (%), not less than</u>
IV	Cellulose esters	Ms	Oil-styrene resins		
		Ep	Epichlorohydrin resins (epoxide resins)		
		Sp	Mixtures of polymerized resins		
		Nts	Nitrocellulose		
		Ets	Ethylcellulose		
		Bts	Benzlcellulose		
		Ats	Acetylcellulose		
		Ab	Acetobutyrate-cellulose		
		Sts	Mixtures of cellulose esters		
		Sr	Other resins or mixtures of resins, not included in the foregoing classes.		
V	Mixtures				

Note: The division into types is the same for all classes of varnishes for natural and condensation resins (Varieties I and II) and for all classes of varnishes for polymerized resins and cellulose esters (Varieties III and IV). For varnishes of Variety V (mixed) the division into types depends upon the variety of the basic resin.

On the basis of the proposed classification the authors have worked out a uniform nomenclature of varnishes in which the division is made according to the basic consumer designation -- the field of use. The need to separate the basic consumer designation from the classification in an independent class, namely, nomenclature, is dictated by the fact that the field of use of the varnish depends wholly upon its properties. The property itself, on the basis of the basic predetermined composition of the varnishes, depends upon many other factors: technology of production, the use of differently prepared raw materials, the introduction of admixtures, and other features. It is natural that the attempt to indicate all these varied factors in the classification is doomed to failure. The combining of classification and nomenclature designations permits the setting up of a strict differentiation of varnishes, and also makes it possible to apply to them very specific and strictly substantiated designations, thereby eliminating the unsystematic and chaotic arrangement currently used for paint and varnish varieties.

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The nomenclature of varnishes provides for dividing them into ten groups, which permits the division of manufactured products according to these groups with sufficiently sharp delineation among the varnishes and with specific designators for each group.

Proposed Nomenclature of Varnishes

<u>Group No</u>	<u>Purpose of Varnishes</u>	<u>Characteristics</u>
1	Varnishes for external work of Class I	Coat should have good physical-mechanical properties and good resistance to atmospheric conditions. Includes varnishes for coating external surfaces of aircraft, light motor vehicles, railroad and street transport vehicles, leather, etc.
2	Varnishes for external work of Class II	Coat should have good physical-mechanical properties and adequate resistance to atmospheric conditions. Includes varnishes for coating external surfaces of agricultural machinery, heavy motor vehicles, bicycles, heavy machine-construction equipment, building facades, etc.
3	Varnishes for internal work of Class I	Coat should have good physical-mechanical properties. Includes varnishes for instruments and apparatus used indoors; for production equipment not subjected to atmospheric conditions; for finishing interior of aircraft, motor vehicles, railroad and street transport vehicles; for high-quality furniture; for decorative-artistic work; etc.
4	Varnishes for internal work of Class II	Coat should have adequate physical-mechanical properties. Includes varnishes for furniture, prosthetic equipment, reinforcing equipment, and other less important work than required for group 3.
5	Varnishes for anti-corrosive covering during periods of extended storage	Coat should have good anticorrosive properties. Includes varnishes used to protect surfaces from deterioration during long periods of storage.
6	Varnishes for temporary coating	Includes varnishes used to coat articles for storage and transport, temporary protection of metal from corrosion (up to 3 months), temporary decorative purposes, etc.
7	Chemically stable varnishes (resistant to active media)	Coat should have good physical-mechanical properties and should be resistant to one or more active media as required by technical specifications. Includes varnishes used for protection of surfaces from action of moisture, acids, alkalis, salts, gases, fuels, solvents, mineral oils, etc.

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Group No	Purpose of Varnishes	Characteristics
8	Heat-resistant varnishes	Includes varnishes used to coat articles subject to action of very high temperatures: Warmth resistance [teplostoykiy], for temperatures up to 100°C Heat resistance [zharostoykiy], for temperatures up to 350°C
9	Electro-insulating varnishes	Includes varnishes used for electrical insulation purposes in various branches of industry.
0	Semifinished varnishes	This group includes varnishes used for the production of enamel paints, bases fillers, and other paint and varnish materials.

Classification and Nomenclature of Enamel Paints

Enamel, or more accurately, varnish paints, consist of a suspension of pigments in varnishes. The properties of enamel paints, as well as of varnishes, depend upon their composition. The basic components, which determine these properties, are varnish, from which the enamel paint is produced, and the basic pigment, which is included in the composition as the pigment part of the paint. Thus, the classification of enamel paints should be set up according to the classification for varnishes with the inclusion of one more division, establishing the pigment part of the enamel.

On the basis of the selection and study of a large amount of experimental data on the formula and property of enamel paints the authors have divided the latter in Group 9 according to the pigment prevalent in the pigment part of the paint. To establish which pigment predetermines the property of any paint, that is, in order to set up a classification of enamel paints according to the pigment group, the minimum quantities of pigment prevalent in the pigment part (in percent) are considered, in which the pigment is predominant. The division of enamel paints for the indicated groups is shown below:

1. Zinc white contained in the pigment part, not less than 70 percent in quantity.
2. Titanium white or titanate contained in the pigment part, not less than 70 percent in quantity.
3. Lithopone white or a mixture of lithopone with zinc white (not less than 1:1 ratio contained in the pigment part), not less than 70 percent in quantity.
4. Carbon black contained in the pigment part, not less than 40 percent in quantity.
5. White lead, red lead, lead chromate, zinc chromate, chromic oxide, and cadmium pigments contained in the pigment part, not less than 30 percent in quantity.
6. Ferric oxide and earth pigments in the pigment part, not less than 50 percent in quantity.
7. Organic pigments and dyes contained in the pigment part, not less than 50 percent in quantity.

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8. Milori blue, ultramarine, or their mixture contained in the pigment part, not less than 40 percent in quantity.

9. Content of metallic bronzes.

The nomenclature for enamel paints, like the nomenclature for varnishes, is set up according to the consumer designations -- the recommended field of use. The divisions among the nomenclature groups may be made according to the same system employed for the varnishes, with the difference that the zero nomenclature group unites the primers which by their composition are also enamel paints but have other proportions of varnish and pigment.

Combinations of classification and nomenclature designations permit the differentiation of enamel paints and the adoption of designations for them according to a rigid system.

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At present, varnishes and paints are designated in a variety of ways. Some are named according to their field of use (insulating varnish, acid-resistant varnish, enamel paints for tractors, enamel paints for external surfaces, etc.) Others are named according to their film-forming properties depending upon their composition (oil varnish, glyptal enamel, etc.). For several products both these indicators are combined (nitrovarnish for leather, nitroglyptal enamel for buses, etc.) Finally, there are paint and varnish materials which are designated only by number without reference to their composition or field of use since a large part of these numbers are derived wholly from foreign practice.

Even in such cases where the number applied to the material has a decipherment, the latter is set up according to completely varied and dissimilar principles and bases. Thus, in aviation enamels A-6, A-7, A-8, etc., the letter A stands for "aviation," and the number for the color (6 - yellow, 7 - green, 8 - brown, etc.). At the same time, in aviation enamel AE-8, the number 8 does not stand for the brown color since this enamel is "aluminum." Similarly, in enamels for general use of mark FO the number 7 is used to indicate an orange color, and pentaphthalic enamel used for coating external surfaces with a green color employs the number 63.

Such designation of paint and varnish products may lead to confusion. It is quite obvious that such a situation cannot lead to a rational utilization of paint and varnish products nor to a unified system.

On the basis of the classification and nomenclature of varnishes and paints suggested above a unified designation system can be set up.

A Designation System for Varnishes

The names of varnishes are established according to the class designation of the varnish (that is, the classification of the varnishes), the nomenclature group (according to the nomenclature of the varnishes), and a serial number, which is adopted for each varnish within the nomenclature group, separately for each class. A dash is placed between the designation for the class of the varnish (letter index) and the designation for the nomenclature group (number index). Following are several examples:

1. Pentaphthalic varnish No 170 (TU MKHP 1308-45) is a solution of pentaphthalic resin, modified by vegetable oils, in organic solvents, and is used as the final coat for streetcars. According to the new system the varnish receives the designation Pf-11, which signifies:

Pf - Class of the varnish according to the classification (varnish in pentaphthalic resins)

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1 - Nomenclature group 1 (varnish for external work of Class I)

1 - Serial number for the given varnish in the first nomenclature group for varnishes in pentaphthalic resins

2. UVL-1 varnish (VTU MKhP 2532-51) is a solution of ureaformaldehyde and alkyde resins in organic solvents and is used to apply as the final coat for bicycles. According to the new system the varnish receives the designation Mch-21, which signifies:

Mch - Class of the varnish according to the classification (varnish in urea-formaldehyde resin)

2 - Nomenclature group 2 (varnish for external work of Class II)

1 - Serial number for the given varnish in the second nomenclature group for varnishes in urea-formaldehyde resin

3. ONILKh-3 varnish (TU MKhP 1250-48) is a solution of perchlorvinyl resin in organic solvents with a plasticizer added. According to the new system the varnish receives the designation Khv-72, which signifies:

Khv - Class of the varnish according to the classification (varnishes in perchlorvinyl resins)

7 - Nomenclature group 7 (chemically stable varnishes)

2 - Serial number of the given varnish in the seventh nomenclature group for varnishes in perchlorvinyl resins

4. Insulating varnish No 462p (TU MKhP 797-41) is a solution of asphaltite and bitumen in organic solvents, and is used to coat impregnated coils in electric motors. According to the new system the varnish receives the designation Bt-98, which signifies:

Bt - Class of the varnish according to the classification (varnishes in bitumens)

9 - Nomenclature group 9 (electrical insulating varnishes)

8 - Serial number of the given varnish in the ninth nomenclature group for varnishes in bitumens, pitches, asphalts, and asphaltites

5. FL-2 varnish (TU MKhP 2011-49) is a solution of glyptal resin, modified by linseed oil, in organic solvents, and is used for the production of enamel paints. According to the new system the varnish receives the designation Gf-02, which signifies:

Gf - Class according to classification (varnish in glyptal resin)

0 - Zero nomenclature group (semi-finished varnish)

2 - Serial number for the given varnish

6. FD-2 varnish (TU MKhP 2011-49) is a solution of glyptal resin, modified by sunflower oil, in organic solvents, and is used for the production of enamel paints. According to the new system the varnish receives the designation Gf-03, which signifies:

Gf - Varnish in glyptal resin

0 - Semifinished

3 - Serial number of the given varnish

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A Designation System for Enamel Paints

A system for designating enamel paints has been set up according to the same principles as for varnishes. It establishes a basis for the designation of semfinished varnish (in cases where the enamel is produced by a mixture of the semfinished varnish and pigment pastes), or film-forming enamel paint (in cases where the production technology does not provide for the use of separately produced semfinished varnish).

The principle for setting up a designation system for semfinished varnishes has been elaborated above. For the designation of enamel paints there is taken the established index for semfinished varnish (or the composition of a derivative numbered according to the same principle), and in place of the number of nomenclature group 0, which determines its relationship to the group of semfinished varnishes, there is substituted a number of the nomenclature group for enamels. For example, enamel for painting agricultural machinery of mark FSKh-14 is produced from semfinished varnishes FL-2 or FD-2. Semfinished varnish FL-2 is called "Varnish Gf-02" in the new system.

According to the nomenclature for enamels this paint belongs to the second nomenclature group and should have a corresponding number (2). Substituting for the nomenclature number varnish 0 the nomenclature number enamel 2, we obtain the designation for enamel paint Gf-22, and the complete designation will be "Enamel, green Gf-22."

Where this same enamel is produced from varnish FD-2 (varnish Gf-03), the complete designation will be "Enamel, green, Gf-23."

If the same semfinished varnish (or the same derivative) is used to produce enamels of various shades (by the use of different pigments), the designation for the enamel remains unchanged, and the color is indicated by the words "red," "green," "blue," "yellow," etc.

Examples for designating various enamel paints, established according to the new system, are cited in the table below:

Designation of Enamel Paints

Number	Old Designation	New Designation	Explanation
1	Black enamel for small automobiles	Enamel, black Gf-116	Gf - glyptal resin 1 - nomenclature group (for external coat- ing of Class I) 16 - serial number for semfinished varnish Produced in varnish Gf-016
2	Green enamel for small automobiles	Enamel, green, Gf-116	
3	Enamel U-416	Enamel, beige, Sk-33	Sk - mixture of condensa- tion resins 3 - nomenclature group (for internal work of Class I) 3 - serial number of semfinished varnish Produced in varnish Sk-03

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<u>Number</u>	<u>Old Designation</u>	<u>New Designation</u>	<u>Explanation</u>
4	Enamel DD-118-B	Enamel, gray, Khv-36	Khv - perchlorvinyl resin 3 - nomenclature group (for internal work of Class I) 6 - serial number for semifinished varnish
5	Primer No 138	Primer Gf-07	Produced in varnish Khv-06 Gf - glyptal resin 0 - nomenclature group (primer) 7 - serial number of semifinished varnish

A scientifically established and rational system of classification, nomenclature, and designation of varnishes and enamel paints will result in greater uniformity of paint and varnish materials and in facilitating a more reasonable utilization by consumers.

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